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Find the *Measurement Computing / IOtech DaqBook/2001* at our website: ***Click HERE***

# DaqBook/2000 Series

## Ethernet-Based Portable Data Acquisition

## Models /2001, /2005, & /2020

### Features

- Analog input, analog output, frequency input, timer output, and digital I/O; all in one compact and portable enclosure
- Built-in Ethernet connection provides continuous streaming to the PC with no data loss
- 16-bit, 200 kHz A/D converter
- Operates from -30 to +70 ˚C
- Powerable from 10 to 30 VDC, or with included AC adapter
- Synchronous analog, digital, and frequency measurements
- Trigger modes include analog, digital, frequency, and software
- Virtually infinite pre-trigger buffer
- Four channels of 16-bit, 100 kHz analog output (models /2001 and /2020)
- DaqBook/2020 offers convenient front panel connectors for thermocouple, voltage and frequency measurements *all in one box*
- DaqBooks attach to over 40 DBK signal conditioning options providing a low-cost system, customized to your particular application

### Signal Conditioning Options

- Signal conditioning and expansion options for thermocouples, strain gages, accelerometers, isolation, RTDs, etc. — over 40 DBK I/O expansion options are available

### Software

- Includes DaqView *Out-of-the-Box* software application for effortless data logging and analysis
- Comprehensive drivers for DASYLab®, NI LabVIEW®, Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- DaqCal software application for easy user calibration
- Supported Operating Systems: Windows 7/Vista/XP SP2, 32-bit or 64-bit

*See DaqOEM/2000 Series for board-level versions of the DaqBook*



*DaqBook/2020*




*DaqBook/2001*

The DaqBook/2000 Series of portable data acquisition devices can synchronously measure analog inputs, frequency inputs, and digital inputs. The 16-bit/200 kHz DaqBooks come equipped with built-in signal I/O capability, which can be further expanded and enhanced with over 40 DBK Series expansion and signal conditioning options.

The DaqBook/2000 Series includes a built-in 10/100BaseT Ethernet interface capable of transferring acquired data back to the PC at the full 200 Kreading/s measurement rate of the DaqBook. Multiple DaqBooks can be attached to a single PC via an Ethernet hub or switch, and are capable of being synchronized and of transferring data continuously at full speed into the PC. Up to 10 DaqBooks can be transferring 200 Kreading/s back to a PC concurrently, with no loss in data.

**Packaging and Power.** The DaqBook is housed in a rugged metal package, with the same footprint as most notebook PCs (8.5" x 11"). It can be powered from 10 to 30 VDC, or via the included AC power adaptor. Compact battery options are also available for applications where there is no access to DC or AC power. These options

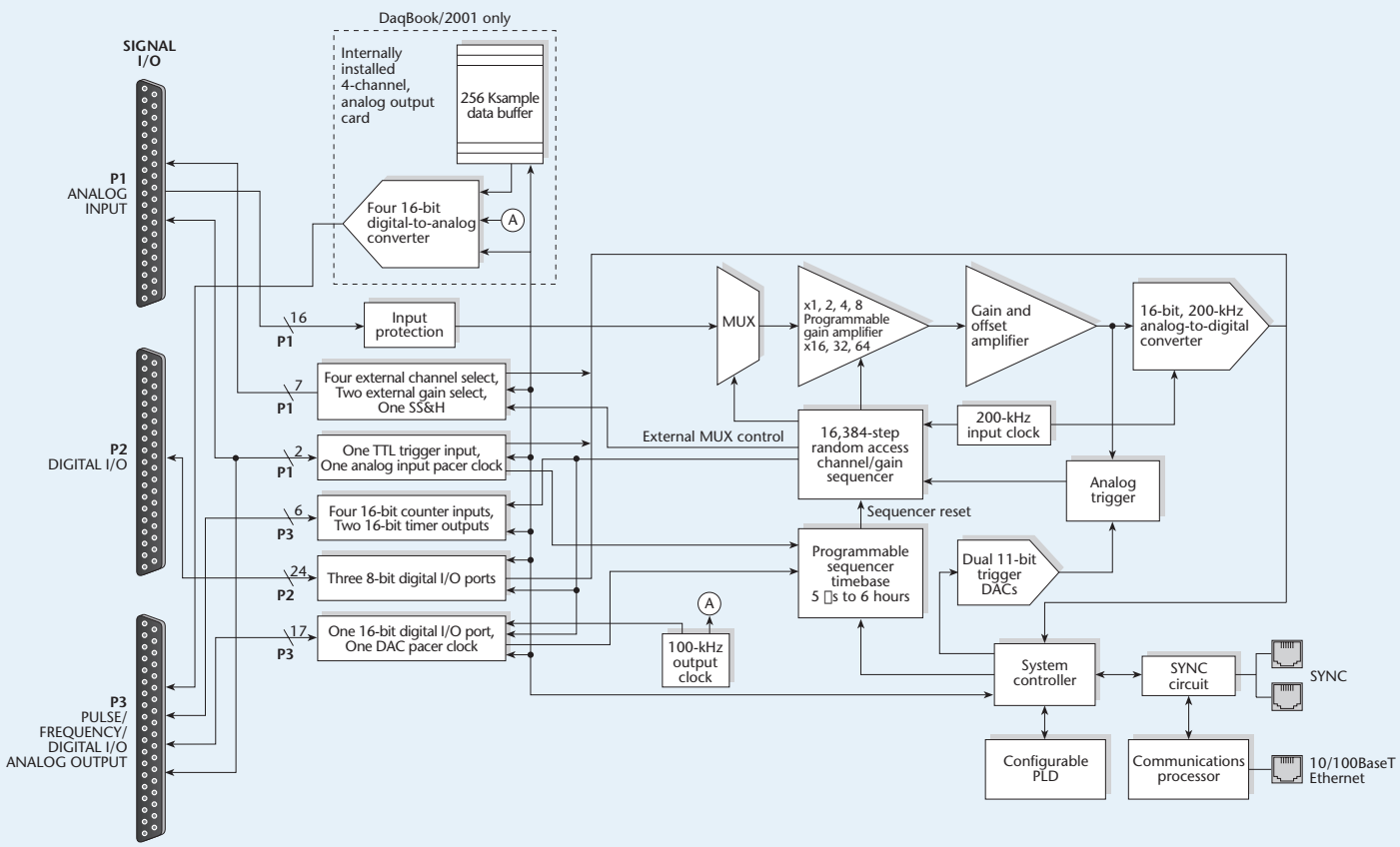
**DaqBook/2000 Series Selection Chart**

| Feature | DaqBook/2020 | DaqBook/2001 | DaqBook/2005 |
|---|---|---|---|
| Package | 2U high, 8.5" x 11" | 1U high, 8.5" x 11" | 1U high, 8.5" x 11" |
| A/D | 16 bit, 200 kHz | 16 bit, 200 kHz | 16 bit, 200 kHz |
| PC Connection | 10/100BaseT Ethernet | 10/100BaseT Ethernet | 10/100BaseT Ethernet |
| Channel/Gain Sequencer | 16,384 locations | 16,384 locations | 16,384 locations |
| Built-in Voltage Inputs | 16 DIFF plus 14 SE | 8 DIFF or 16 SE | 8 DIFF or 16 SE |
| Built-in Thermocouple Inputs | 14 | 0 | 0 |
| Analog Signal Connection | BNC, mini TC | DB37 | DB37 |
| Built-in Digital I/O | 24 | 40 | 40 |
| Maximum Digital I/O | 256 | 272 | 272 |
| Built-in Frequency Inputs | 4, 16 bit, 10 MHz | 4, 16 bit, 10 MHz | 4, 16 bit, 10 MHz |
| Built-in Timer Outputs | 2, 16 bit, 1 MHz | 2, 16 bit, 1 MHz | 2, 16 bit, 1 MHz |
| Analog Outputs | 4, 16 bit, 100 kHz | 4, 16 bit, 100 kHz | — |
| External DAC Pacer Clock Input | no | yes | yes |



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### DaqBook/2001 & /2005 Block Diagram




can also function as uninterruptible power supplies (UPS), to keep the DaqBook operational during intermittent power outages or voltage drops, such as during automobile engine cranking. A high-power DC/DC converter built into the DaqBook is capable of powering a large number of DBK signal conditioning and expansion options.

**Signal Conditioning and Expansion.** The DaqBook can expand its built-in analog and digital I/O with the DBK family of over 40 signal conditioning and expansion options (see chart for channel expansion capacity). Every analog, digital, and counter input channel is measured in 5 µs/channel, regardless of whether it is a built-in channel, or an expansion channel*. Included DaqView software automatically converts the sensor measurements to real-world readings, such as temperature, strain, etc.

The on-board 24 digital I/O lines can be expanded up to 272 I/O channels (256 maximum for DaqBook/2020), including TTL level, isolated, and relay closure. Digital inputs, either on the DaqBook, or on expansion options, can be scanned in 8- or 16-bit increments along with analog inputs, providing digital data that is time-correlated to acquired analog data (5 µs per 16 bit input). The 4 frequency and pulse-counting inputs on the DaqBook can also be scanned synchronously with the analog and digital inputs.

## Software Support

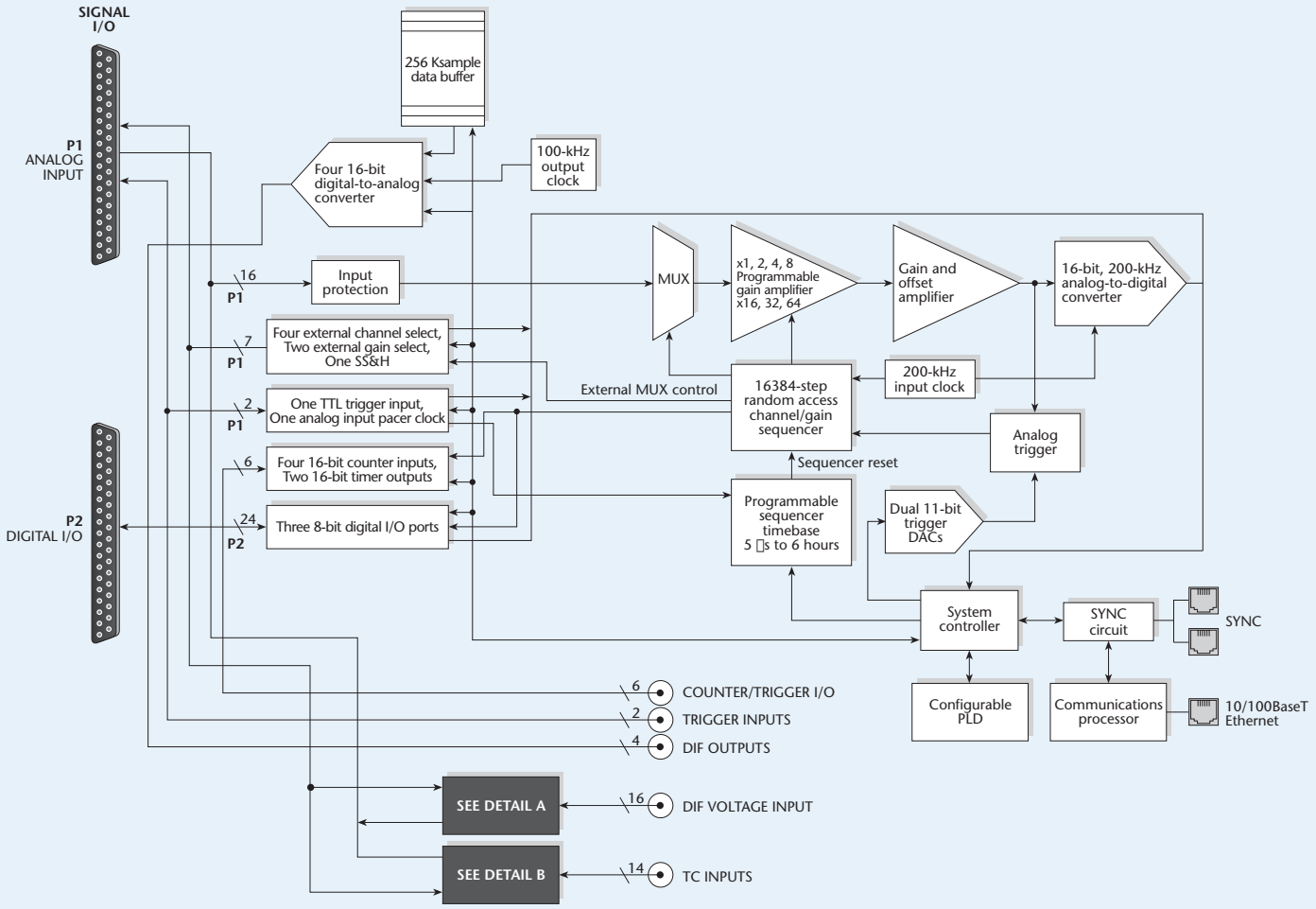
Software support for the DaqBook/2000 Series includes comprehensive drivers for DASYLab®, NI LabVIEW®, Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET. Also included is DaqView *Out-of-the-Box* software for quick and easy set up and collection of data without programming, along with DaqCal software application for easy user calibration. Post-acquisition analysis is achieved via included PostView.

* Except DBK90 T/C options

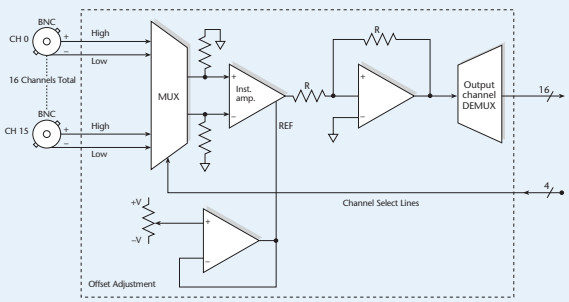



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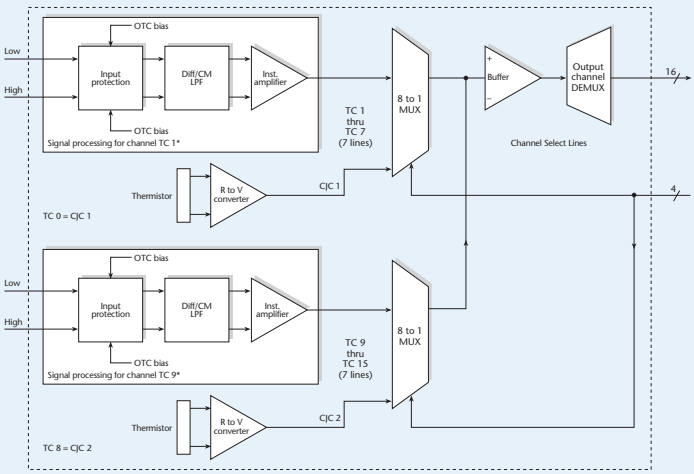
### DaqBook/2020 Block Diagram




### Detail A – Differential Voltage Inputs




### Detail B – Thermocouple Inputs




* The 14 thermocouple circuitry channels, TC1 through TC7 and TC9 through TC15, each have their own signal processing block, consisting of input protection, a low-pass filter, and an instrument amplifier. Channels TC0 and TC8 are used for Cold Junction Compensation (CJC).




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# DaqBook/2000 Series
## General Information

The example systems below illustrate typical systems assembled using the DaqBook/2020 and DaqBook/2001 A/D mainframes.

### DaqBook/2020



*DaqBook/2020 (front and back)*



*DaqBook/2020 system plus 32 additional channels of analog input (DBK85)*



*DaqBook/2020 system plus112 additional channels of thermocouple input (DBK90)*

### DaqBook/2001 & /2005



*DaqBook/2001 (front and back)*



*DaqBook/2001 plus DBK60 module with three internal signal conditioning boards*



*DaqBook/2001 plus 14 channels of thermocouple inputs (DBK84)*



*DaqBook/2001 plus 112 channels of thermocouple input (DBK90)*



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# DaqBook/2000 Series
## General Information

## Analog Input
### (P1 on /2001 & /2005, front panel BNC & mini TC on /2020)
The DaqBook has a 16-bit, 200 kHz A/D coupled with single-ended or differential analog inputs. The DaqBook/2001 and /2005 have 8 differential or 16 single-ended inputs via rear panel DB37, software programmable* on a per-channel basis.

The DaqBook/2020 has 16 differential voltage inputs via front-panel BNCs, plus 14 TC inputs via front-panel mini-TC connectors. The TC inputs can measure any supported TC-type attached to any channel.

Thirteen software programmable voltage ranges provide inputs from ±10V to ±156 mV full scale. Each voltage channel can be software-configured for a different range, as well as for unipolar or bipolar input. Beyond the 16 built-in analog inputs, the user can expand the DaqBook using external DBK signal conditioning and expansion options. As with the on-board channels, expansion channels are scanned at the same 5 µs/channel rate (200 kHz), and most are software-programmable for range. There is *no* speed penalty for scanning expansion channels versus built-in channels, with the exception of the DBK90 option, which are scanned at 1 msec per channel. DBK expansion options offer a wide variety of signal measurements, including thermocouples, RTDs, strain gages, accelerometers, high voltage, isolation, current, and much more.

## Calibration
Every range on the DaqBook is calibrated from the factory using a digital calibration method. This method works by storing a correction factor for each range on the DaqBook at the time of calibration. Whenever a particular range is selected by the sequence, the appropriate calibration constant is automatically applied to a compensating DAC, thereby calibrating the specific range. The resultant readings generated by the A/D are already calibrated, and do not require additional processing.

The DaqBook also has a user-cal mode, whereby the user can adjust the calibration of the DaqBook, without destroying the factory calibration supplied. This is accomplished by having two distinct calibration tables in the DaqBook's on-board EPROM, one which contains the factory cal, and the other which is available for user calibration.

## Analog Output
### (P3 on /2001, front-panel BNC on /2020)
Four channels of 16-bit/100 kHz analog output are built into the DaqBook/2020 and /2001. 256 Ksamples of memory are included, which can store waveforms loaded from the PC.

When used to generate continuous outputs, the D/As can be clocked in several different modes**. Each D/A can be separately selected to be clocked from one of the sources described below. Analog outputs are available on the /2020 via front-panel BNCs, and on the /2001 via rear-panel DB37 (P3).

**Asynchronous internal clock.** The on-board programmable clock can generate updates ranging from 1.5 Hz to 100 kHz, independent of any acquisition rate.

**Synchronous internal clock.** The rate of analog output update can be synchronized to the acquisition rate derived from 100 kHz to once every 5.96 hours.

**Asynchronous external clock.** A user-supplied external input clock can be used to pace the D/A, entirely independent of analog inputs.

**Synchronous external clock.** A user-supplied external input clock can pace both the D/A and the analog input.

## Digital Inputs & Outputs (P2, P3)
The DaqBook's P2 connector provides 24 TTL-level digital I/O lines, divided into three 8-bit ports. The P2 ports can be programmed in 8-bit groups as either input or output.

In addition, the P2 ports can be expanded up to 256 digital I/O lines using external DBK digital options. These options are available as TTL-level I/O, relay output, or optically isolated input and output. Whenever expansion digital I/O is attached to the DaqBook, the P2 I/O lines are no longer user-programmable, and are instead used to communicate with the digital expansion options.

In addition, the DaqBook/2001 and /2005 provide 16 bits of digital I/O on their P3 port, which can be programmed as all inputs or all outputs. Ports programmed as inputs can be part of the scan group and read synchronous with other analog and digital input channels, or can be read asynchronously via the PC at any time, including when a scanned acquisition is occurring.

## Counter Inputs
### (P3 on /2001 & /2005, front-panel BNC on /2020)
Four 16-bit counters are built into the DaqBook, each capable of counting up to 65,536 TTL-level transitions. Each of the four counters will accept frequency inputs up to 10 MHz†. The counters can also be cascaded, allowing over four billion counts to be accumulated. As with all other inputs to the DaqBook, the counter inputs can be read asynchronously under program control, or synchronously as part of an analog and digital scan group. Counters can be programmed to totalize or clear-on-read.

## Timer Outputs
### (P3 on /2001 & /2005, front-panel BNC on /2020)
Two 16-bit timer outputs are built into the DaqBook, each capable of generating different square waves with a programmable frequency range from 16 Hz to 1 MHz.

* Requires programming language
** Not recommended for closed loop control greater than 1 Hz
† For mixed signal applications requiring frequency measurement along with high-speed analog inputs, see DBK7



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## Scanning

The DaqBook has an on-board scan sequencer that permits the user to select any combination of up to 16,384 channel/range combinations. The sequencer scans all channels contained in the sequence at the fastest rate of 5 µs/channel, thereby minimizing the time-skew from channel-to-channel (when DBK90 option channels are scanned, their scan time is 1 msec/channel). The user can also set the time between scan groups, from 0 to 6 hours. In addition to scanning analog inputs, the sequencer can scan digital inputs and counter inputs.

## Triggering

Triggering can be the most critical aspect of a data acquisition application. The DaqBook supports a full complement of trigger modes to accommodate any measurement situation.

**Hardware Analog Triggering.** Many data acquisition products claim analog triggering, but rely on the PC to take readings and make a decision, which leads to uncertain and potentially long latencies. The DaqBook uses true analog triggering, whereby the trigger level programmed by the user sets an analog DAC, which is then compared in hardware to the analog input level on the selected channel. The result is analog trigger latency which is guaranteed to be less than 5 µs, significantly shorter than most data acquisition devices. Any analog channel can be selected as the trigger channel, including built-in or expansion channels. The user can program both the trigger level, as well as the edge (rising or falling).

**Digital Triggering.** A separate digital trigger input line is provided, allowing TTL-level triggering, again with latencies guaranteed to be less than 5 µs. Both the logic levels (1 or 0), as well as the edge (rising or falling), can be programmed for the discrete digital trigger input.

**Digital Pattern Triggering.** The DaqBook also supports digital pattern triggering, whereby the user can designate any of the digital input ports as the trigger port. The programmed digital pattern, including the ability to mask or ignore specific bits, is then compared to the actual input until a match is detected, after which the sequencer begins the scan sequence.

**Counter Triggering.** Triggering can also be programmed to occur when one of the counters reaches, exceeds, or is within a programmed level. Any of the built-in counter/totalizer channels can be programmed as a trigger source.

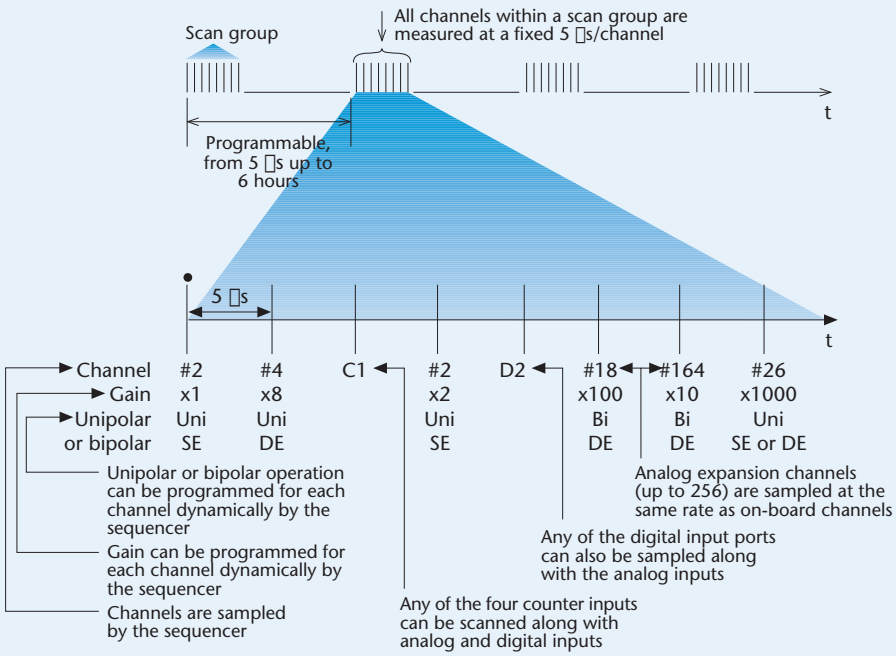
**Software-Based Triggering.** Software-based triggering differs from the modes described above because the readings, analog, digital, or counter, are interrogated by the PC to detect the trigger event, not in the hardware as described above. The advantage of this mode is to permit triggering based on more complex situations, such as on a specific temperature, which was derived from the acquisition of at least two analog measurements, plus the calculation of the measured temperature using linearization algorithms.

Normally software-based triggering results in long latencies from the time that a trigger condition is detected, until the actual capturing of data commences. However, the DaqBook circumvents this undesirable phenomenon by use of pre-trigger data. Specifically, when software-based triggering is employed, and the PC detects that a trigger condition has been met, the DaqBook driver

## Channel-Scanning Flexibility

The DaqBook offers a 16,384 location scan sequencer that allows you to select each channel and associated input amplifier gain at random. The sequencer circuitry circumvents a major limitation encountered with many data acquisition devices — a drastic reduction in the scan rate for external expansion channels. All built-in and expansion channels, are scanned at 100 kHz or 200 kHz (5 or 10 µs/channel). In addition, the digital and frequency inputs can be scanned using the same scan sequencer employed for analog inputs, enabling the time correlation of acquired digital data to acquired analog data. The DaqBook permits each scan group, which can contain up to 16,384 channel/gain combinations, to be repeated immediately or at programmable intervals of up to 6 hours. Within each scan group, consecutive channels are measured at a fixed 5 or 10 µs/channel rate.

**DaqBook Scanning Example**







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automatically looks back to the location in memory where the actual trigger-causing measurement occurred. The acquired data that is presented to the user actually begins at the point where the trigger-causing measurement occurs. The latency in this mode is equal to one scan cycle.

**Pre- and Post-Triggering Modes.** Six modes of pre- and post-triggering are supported, providing a wide variety of options to accommodate any measurement requirement. When using pre-trigger, the user must use software-based triggering to initiate an acquisition.

***No pre-trigger, post-trigger stop event.*** This, the simplest of modes, acquires data upon receipt of the trigger, and stops acquiring upon receipt of the stop-trigger event.

***Fixed pre-trigger with post-trigger stop event.*** In this mode, the user specifies the number of pre-trigger readings to be acquired, after which, acquisition continues until a stop-trigger event occurs.

***No pre-trigger, infinite post-trigger.*** No pre-trigger data is acquired in this mode. Instead, data is acquired beginning with the trigger event, and is terminated when the operator issues a command to halt the acquisition.

***Fixed pre-trigger with infinite post-trigger.*** The user specifies the amount of pre-trigger data to acquire, after which the system continues to acquire data until the program issues a command to halt acquisition.

***Variable pre-trigger with post-trigger stop event*.*** Unlike the previous pre-trigger modes, this mode does not have to satisfy the pre-trigger number of readings before recognizing the trigger event. Thus the number of pre-trigger readings acquired is variable and dependent on the time of the trigger event relative to the start. In this mode, data continues to be acquired until the stop trigger event is detected.

***Variable pre-trigger with infinite post trigger*.*** This is similar to the mode described above, except that the acquisition is terminated upon receipt of a command from the program to halt the acquisition.

**Stop Trigger.** Any of the software trigger modes described above can also be used to stop an acquisition. Thus an acquisition can be programmed to begin on one event, such as a temperature level, and then can stop on another event, such as a digital pattern.

## Multi-Unit Synchronization

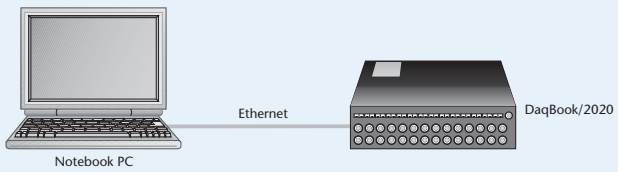
Multiple DaqBooks can be synchronized via the rear panel SYNC ports. By connecting cable CA-74-1, up to 4 DaqBooks can be synchronized so that all acquired data is time correlated. DaqBook software will establish one unit as a "master" and the others as "slaves"**. Master DaqBooks can run at the full 200 kHz aggregate sampling rate, slaves must have 1 µs of unassigned sampling time in their scan group. Not all trigger modes are supported in multi-DaqBook configurations.

* When digital pattern generation is used, one of the analog output channels is limited to asynchronous output mode

** Multi-unit synchronization is included with all software support except DaqView

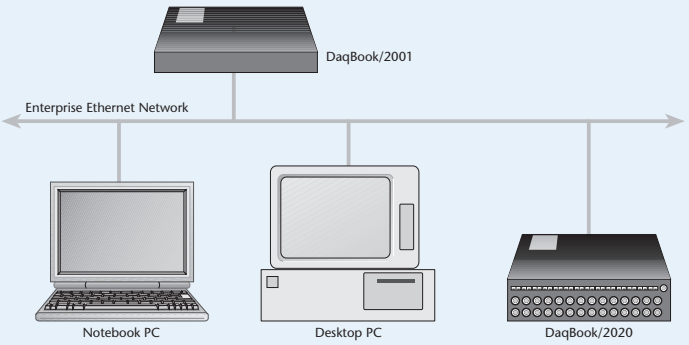
## Ethernet Connection

The most common configuration for a DaqBook is when directly attached to a PC via a point-to-point Ethernet link. In this mode, data transfers will occur at the full 200 Kreadings per second rate of the DaqBook, insuring that no data is lost during transfer.



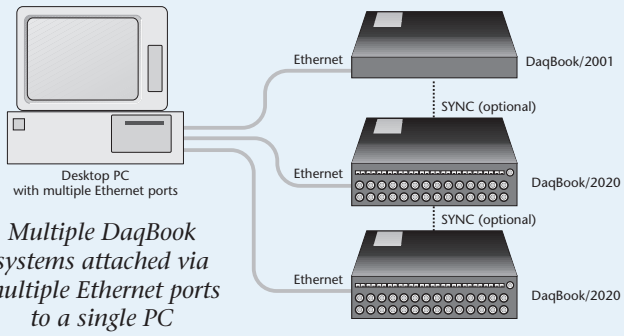

*Point-to-point Ethernet connection*

The DaqBook can also be attached to an enterprise-wide network, where it is one of many devices on the network. In this application, the data transfer rate is highly dependent on other data traffic on the network.




*Enterprise-wide Ethernet connection*

A virtually unlimited number of DaqBooks can be attached to a PC when an Ethernet switch is employed. As in the case above, the DaqBooks can be operated as one synchronous system, or can be operated as entirely independent systems, each with their own independent triggering and sampling rates.




*Multiple DaqBook systems attached via multiple Ethernet ports to a single PC*



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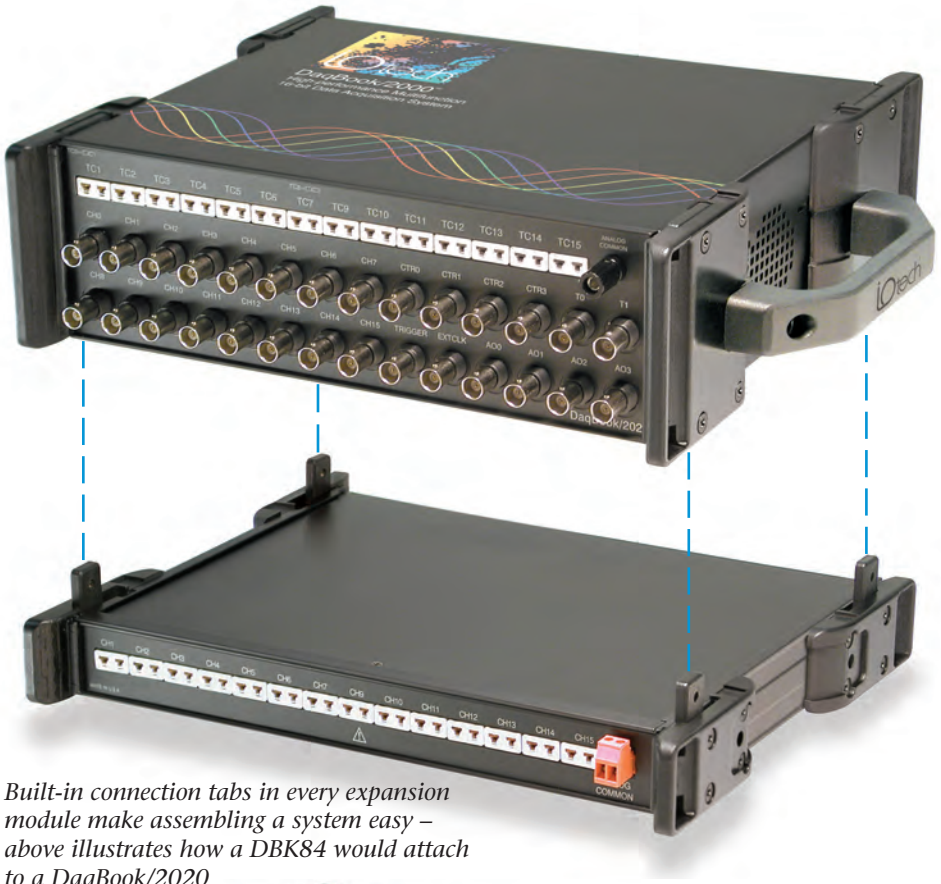
# Module-to-Module Connection

## for DaqBook Systems

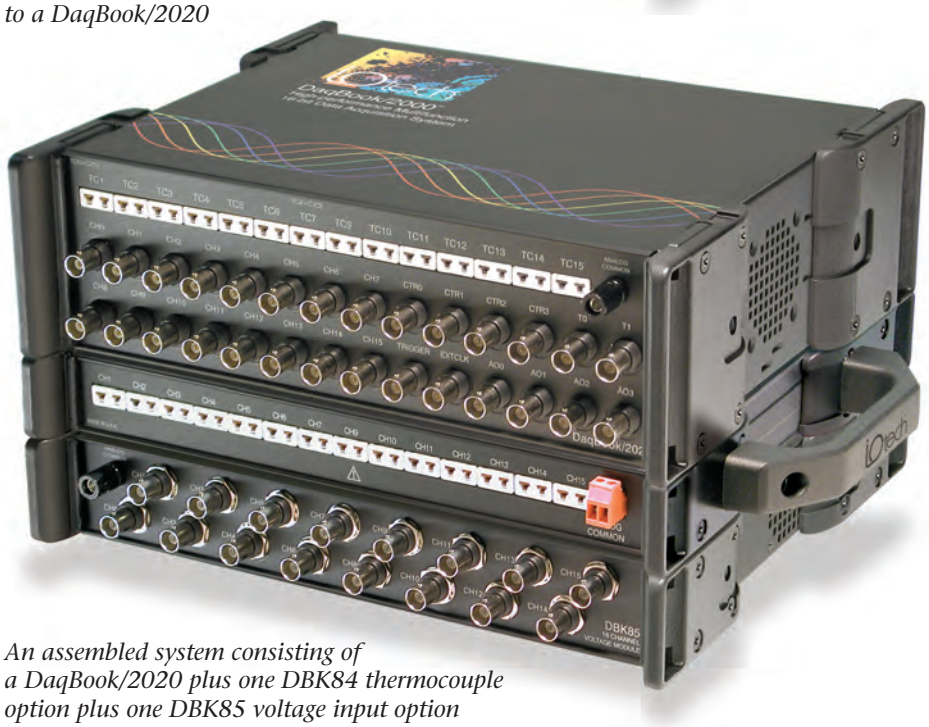
Assembling a DaqBook system is easy with our packaging and module-to-module connection system. Every DaqBook and DBK option is housed in an all-metal enclosure, and is encased with rugged molded bumpers on all corners. The bumpers serve to protect the connectors as well as to attach multiple modules together. Within each bumper is a tab which can be rotated 90˚ to lock with other modules attached to either the top or bottom of each module.

One handle is included with each DaqBook, and additional handles can be purchased for in-vehicle applications where a handle on both sides of the system is desirable for securing the system to the vehicle. When multiple modules are attached in a system, the handle can be easily moved from the DaqBook to any other module in the system.

For owners of existing DaqBook and/or DBK systems, the new bumpers can be easily added to your existing hardware.



*Built-in connection tabs in every expansion module make assembling a system easy – above illustrates how a DBK84 would attach to a DaqBook/2020*



*An assembled system consisting of a DaqBook/2020 plus one DBK84 thermocouple option plus one DBK85 voltage input option*



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# DaqBook/2000 Series
## Specifications

MEASUREMENT COMPUTING

## Specifications

### General

**Supply Voltage Range:** 10 to 30 VDC
**Power Required:** 15W (assuming no DBK options)
**Power Available for External Signal Conditioning and Expansion Options:** 5V at 1A; ±15V at 500 mA each, not to exceed 7W on /2020, and not to exceed 10W on /2001 and /2005
**Operating Temperature:** -30 to +70 ˚C
**Storage Temperature:** -40 to +80 ˚C
**Relative Humidity:** 0 to 95%, non-condensing
**Vibration:** MIL STD 810E, category 1 and 10
**Signal I/O Connector**
**/2001 & /2005:** DB37 male for P1, P2, P3
**/2020:** BNC and mini-TC DB37 male for P1, P2
**Dimensions**
**/2001 & /2005:** 285 mm W x 220 mm D x 45 mm H (11″ x 8.5″ x 1.75″)
**/2020:** 285 mm W x 220 mm D x 90 mm H (11″ x 8.5″ x 3.5″)
**Weight**
**/2001 & /2005:** 1.36 kg (3 lbs)
**/2020:** 2.5 kg (5.5 lbs)
**Maximum Ethernet Cable Length:** 100 meters (can be increased with standard Ethernet switch device)

### A/D Specifications

**Type:** Successive approximation
**Resolution:** 16 bit
**Conversion Time:** 5 µs
**Maximum Sample Rate:** 200 kHz
**Nonlinearity (Integral):** ±1 LSB
**Nonlinearity (Differential):** No missing codes

### Analog Inputs (P1)

**Channels**
**/2001 & /2005:** 16 single-ended or 8 differential, programmable on a per-channel basis as single-ended or differential and unipolar or bipolar
**/2020:** 16 differential inputs via front panel BNC, and 14 single-ended via rear panel DB37 (P1)
**Expansion:** Up to 256 channels, without degradation in max channel-to-channel scan rate (5 or 10 µs/channel)
**Total Harmonic Distortion:** -84 dB typ
**Signal to Noise and Distortion:** 80 dB typ
**Noise:** 2 LSBRMS typ
**Bandwidth:** 500 kHz
**Settling Time:** 5 µsec to 1 LSB for full-scale step
**Temperature Coefficient:** ±(0.002% reading + 0.03 mV) or ±(0.002% reading + 0.6 LSB), whichever is larger, per ˚C outside of temperature range of 18 to 28 ˚C
**Input Impedance:** 10M Ohm (single-ended), 20M Ohm (differential)†
**Bias Current:** <1 nA (0 to 35 ˚C)
**Common Mode Rejection:** 86 dB, DC to 60 Hz for gains < =8; >100 dB for gains > =16
**Maximum Input Voltage (without damage):** ±11V relative to analog common
**Over-Voltage Protection:** ±35V
**Ranges:** Software or sequencer selectable on a per-channel basis
**Crosstalk:** -100 dB DC to 60 Hz; 86 dB @ 10 kHz

| Voltage Range* | Accuracy** One Year, 23° ±5°C | |
|---|---|---|
| | % reading | + millivolts |
| 0 to 10 | 0.015 | 0.80 |
| 0 to 5 | 0.015 | 0.40 |
| 0 to 2.5 | 0.015 | 0.20 |
| 0 to 1.25 | 0.015 | 0.12 |
| 0 to 0.625 | 0.015 | 0.10 |
| 0 to 0.3125 | 0.015 | 0.08 |
| -10 to 10 | 0.015 | 1.50 |
| -5 to 5 | 0.015 | 0.80 |
| -2.5 to 2.5 | 0.015 | 0.40 |
| -1.25 to 1.25 | 0.015 | 0.20 |
| -0.625 to 0.625 | 0.015 | 0.12 |
| -0.3125 to 0.3125 | 0.015 | 0.10 |
| -0.156 to 0.156 | 0.015 | 0.08 |

* Specifications assume differential input single channel scan, 200-kHz scan rate, unfiltered
** Accuracy specification is exclusive of noise

### Analog Inputs
(Front panel BNCs, /2020 only)

**Inputs:** 5 µs max to 1 LSB for full-scale step
**Maximum Voltage Range:** ±10V
**Input Impedance:** 20M Ohm
**Accuracy**
**For Gains 1, 2:**
±[0.1% of reading + 0.005% of range]
**For Gains 4, 8, 16, 32, 64:**
±[0.1% of reading + 250 µV]
**Total Harmonic Distortion:** -84 dB typ
**Signal to Noise and Distortion:** 80 dB typ
**Noise:** 2 LSBRMS typ
**Maximum Input Voltage (without damage):** ±35V
**3 dB Bandwidth:** 2.6 MHz
**Temperature Coefficient:** 10 ppm for every degree outside the range of 0 to 50 ˚C

### Thermocouple Inputs
(Model /2020 only)

**TC/mV Connector:** Mini-TC connectors
**Functions:** TC types J, K, S, T, E, B, R, N; x100 (voltage)
**Inputs:** 14 differential TC/mV inputs
**Input Voltage Range:** ±100 mV
**Input Impedance:** 40M Ohm (differential); 20M Ohm (single-ended)
**Input Bandwidth:** 4 Hz
**Input Bias Current:** 10 nA typ
**CMRR:** 100 dB typ
**Maximum Working Voltage (signal + common mode):** ±10V
**Over-Voltage Protection:** ±40V
**Voltage Accuracy:** ±(0.2% of rdg +50 µV)
**Temperature Coefficient:** 10 ppm for every degree outside the range of 0 to 50 ˚C
**TC Accuracy††:** Valid for one year, 18 to 28 ˚C; see table below
**Temperature Coefficient for Type T TC:** ±0.03 ˚C per ˚C ambient outside the range of 18 to 28 ˚C
**Minimum Resolution:** 0.1 ˚C for all TC types

### Input Sequencer

Analog, digital and frequency inputs can be scanned synchronously, based on either an internal programmable timer, or an external clock source.
**Scan Clock Sources:** 2
1. Internal, programmable from 5 µs to 5.96 hours in 1 µs steps
2. External, TTL level input up to 200 kHz max

**Programmable Parameters per Scan:** Channel (random order), gain, unipolar/bipolar
**Depth:** 16,384 locations
**On-Board Channel-to-Channel Scan Rate:** 5 or 10 µs per channel, programmable
**Expansion Channel Scan Rate:** 5 or 10 µs per channel, programmable (1 msec with DBK90)

| TC Accuracy at Measurement Temperature in ˚C (±˚C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Min | Max | -100 | 0 | 100 | 300 | 500 | 700 | 900 | 1100 | 1400 |
| J | -200 | 760 | 0.8 | 0.7 | 0.7 | 0.8 | 0.9 | 0.9 | — | — | — |
| K | -200 | 1200 | 0.9 | 0.8 | 0.8 | 0.9 | 1.1 | 1.1 | 1.2 | 1.3 | — |
| T | -200 | 400 | 0.9 | 0.8 | 0.8 | 0.8 | — | — | — | — | — |
| E | -270 | 650 | 0.8 | 0.7 | 0.7 | 0.7 | 0.8 | — | — | — | — |
| S | -50 | 1768 | — | 3.1 | 2.4 | 2.0 | 2.0 | 1.9 | 2.0 | 2.1 | 2.1 |
| R | -50 | 1768 | — | 3.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.7 | 1.9 | 2.0 |
| B | 50 | 1780 | — | — | — | 4.9 | 3.2 | 2.8 | 2.4 | 2.3 | 2.0 |
| N28 | -270 | 400 | 1.2 | 0.9 | 0.9 | 0.9 | — | — | — | — | — |
| N14 | 0 | 1300 | — | 0.9 | 0.9 | 0.9 | 1.1 | 1.1 | 1.2 | 1.3 | — |

† For high impedance transducer connection, see DBK8
†† Accuracy conditions:
- Exclusive of thermocouple errors
- Exclusive of noise
- VCM=0
- 25 ˚C ambient temperature, stabilized for 1 hour


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# DaqBook/2000 Series
## Specifications

### External Acquisition Scan Clock Input
**Maximum Rate:** 200 kHz
**Clock Signal Range:** 0V to +5V
**Minimum Pulse Width:** 50 ns high, 50 ns low
**External SYNC Port:** Available on rear panel, allows multiple DaqBook units to be scan-synchronous (post trigger)

### Triggering
**Trigger Sources:** 6, individually selectable for starting and stopping an acquisition. Stop acquisition can occur on a different channel than start acquisition; stop acquisition can be triggered via modes 2, 4, 5, or 6 described below.

#### 1. Single-Channel Analog Hardware Trigger
Any analog input channel can be software programmed as the analog trigger channel, including any of the analog expansion channels.
**Input Signal Range:** -10 to +10V max
**Trigger Level:** Programmable (11-bit resolution)
**Hysteresis:** Programmable (11-bit resolution)
**Latency:** 5 µs max

#### 2. Single-Channel Analog Software Trigger
Any analog input channel, including any of the analog expansion channels, can be selected as the software trigger channel. If the trigger channel involves a calculation, such as temperature, then the driver automatically compensates for the delay required to obtain the reading, resulting in a maximum latency of one scan period.
**Input Signal Range:** Anywhere within range of the selected trigger channel
**Trigger Level:** Programmable (16-bit resolution), including "window triggering"
**Latency:** One scan period max

#### 3. Single-Channel Digital Trigger
A separate digital input is provided for digital triggering.
**Input Signal Range:** -15V to +15V
**Trigger Level:** TTL
**Minimum Pulse Width:** 50 ns high, 50 ns low
**Latency:** 5 µs max

#### 4. Digital Pattern Triggering
8- or 16-bit pattern triggering on any of the digital input ports. Programmable for trigger on equal, above, below, or within/outside of a window. Individual bits can be masked for "don't care" condition.
**Latency:** One scan period max

#### 5. Counter/Totalizer Triggering
Counter/totalizer inputs can trigger an acquisition. User can select to trigger on a frequency or on total counts that are equal, above, below, or within/outside of a window.
**Latency:** One scan period, max

#### 6. Software Triggering
Trigger can be initiated under program control.

### Analog Output (Models /2001 & /2020)
The four analog output channels are updated synchronously relative to scanned inputs, and clocked from either an internal onboard clock, or an external clock source (/2001 only). Analog outputs can also be updated asynchronously, independent of any other scanning in the system.
**Channels:** 4
**Resolution:** 16 bits
**Data Buffer:** 256 Ksample divided by number of analog outputs
**Output Voltage Range:** ±10V
**Output Current:** ±10 mA
**Offset Error:** ±0.0045V max
**Digital Feedthru:** 50 mV when updated
**Gain Error:** ±0.01%
**Update Rate:** 100 kHz max, 1.5 Hz min (no min with external clock)
**Settling Time:** 10 µsec max to 1 LSB for full-scale step
**Clock Sources:** 4, programmable
1. Onboard D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock (not available on /2020)
4. External scanning input clock

### Digital I/O
**Channels**
**/2001 & /2005:** 40 built-in, expandable to 272
**/2020:** 24 built-in, expandable to 256
**Input Scanning Modes:** 2
1. Asynchronous, under program control at any time relative to input scanning
2. Synchronous with input scanning

**Ports**
**/2001 & /2005:** 3 x 8-bit, and 1 x 16-bit; each port is programmable as input or output
**/2020:** 3 x 8-bit
**Input Protection:** ±8 kV ESD clamp diodes parallel
**I/O Levels:** TTL
**Sampling Rate:** 200 kHz max
**Update Rate:** Asynchronous under program control

### Frequency/Pulse Counters
Counter inputs can be scanned synchronously along with analog and digital scanned inputs, based either on internal programmable timer, or an external clock source. Counters can be configured to clear when read, or to totalize and clear under program control.
**Channels:** 4 x 16-bit; cascadable as 2 x 32-bit
**Frequency Measurement Rate:** 10 MHz max
**Input Signal Range:** -15V to +15V
**Trigger Level:** TTL
**Minimum Pulse Width:** 50 ns high, 50 ns low

### Frequency/Pulse Generators
**Channels:** 2 x 16-bit
**Output Waveform:** Square wave
**Output Rate:** 1 MHz base rate divided by 1 to 65,535 (programmable)
**High-Level Output Voltage:** 2.0V min @ -3.75 mA; 3.0V min @ -2.5 mA
**Low-Level Output Voltage:** 0.4V max @ 2.5 mA


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## Ordering Information

| Description | Part No. |
|---|---|
| All DaqBook models include documentation on CDROM, quick start guide, DaqView; drivers for DASYLab®, NI LabVIEW®, Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET; plus DaqCal software application | |
| Ethernet 16-bit, 200 kHz data acquisition system | DaqBook/2005 |
| Same as above plus 4 channels of analog output | DaqBook/2001 |
| Ethernet 16 bit, 200 kHz data acquisition system with front-panel BNC and TC input channels | DaqBook/2020 |

## Accessories & Cables

| | |
|---|---|
| Rack mount kit for /2001 and /2005 | RackDBK3 |
| Rack mount kit for /2020 | RackDBK1 |
| Molded expansion cable from DaqBook to DBK modules; 2 in. | CA-255-2T |
| Molded expansion cable from DaqBook to DBK modules; 4 in. | CA-255-4T |
| DBK expansion cable from DaqBook to DBK modules; 2.5 in. | CA-37-1T |
| DBK expansion cable from DaqBook to DBK modules; 4.5 in. | CA-37-3T |
| Expansion-card cable for connecting DBK Series expansion options; specify number of option cards (x) to be connected | CA-37-x |
| SYNC cable for multi-unit synchronization; 1 ft. | CA-74-1 |
| 5-pin male DIN to 5-pin male DIN provides convenient connection between DaqBook power input connectors and battery packs | CA-115 |
| 5-pin DIN to automobile cigarette lighter power cable, 8 ft. | CA-116 |

### RTDs

| Description | Part No. |
|---|---|
| 3-wire, 100 ohm, sealed with alumina tube, 1 m | 745691-01 |
| 3-wire, 100 ohm, platinum (ready made), 2 m | 745691-02 |

### Thermocouples

| | |
|---|---|
| E-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F) 1 m | 745690-E001 |
| E-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F) 2 m | 745690-E002 |
| J-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F 1 m | 745690-J001 |
| J-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F) 2 m | 745690-J002 |
| K-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F) 1 m | 745690-K001 |
| K-type thermocouple wire, fiberglass (0 ˚C to 482 ˚C, 32 ˚F to 900 ˚F) 2 m | 745690-K002 |
| T-type thermocouple wire, fiberglass (0 ˚C to 260 ˚C, 32 ˚F to 500 ˚F) 1 m | 745690-T001 |
| T-type thermocouple wire, fiberglass (0 ˚C to 260 ˚C, 32 ˚F to 500 ˚F) 2 m | 745690-T002 |

## Software

| | |
|---|---|
| Icon-based data acquisition, graphics, control, and analysis software | DASYLab |



*CA-255-xT molded expansion cable for connecting DaqBook to DBK modules*




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